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ABSTRACT

This guide for evaluating microcomputer instructional software includes a hardware/software interface analysis sheet which can be used to determine if the software being evaluated is compatible with the hardware on which it will be used. Also provided is an instructional software evaluation form for use in making judgments about (1) specific instructional objectives, (2) grade level, (3) validation data, (4) correlation data, (5) instructional strategies employed in the software, and (6) instructional design features. Appendices include a listing of seven computer users' groups and local computer clubs in California, Ohio, and Pennsylvania; a listing of eight computer software libraries; a short bibliography of resources; and a list of organizations concerned with computer assisted instruction. A glossary of terms dealing specifically with microcomputer software is also appended. (LLS)

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INSTRUCTIONAL SOFTWARE SELECTION

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In a recent DELPHI forecast a group of computer scientists predicted the following:

> By 1980 the small business computer is expected to be used in twice as many businesses as in 1976.
>
> By 1992 all factual information will be on computer files and libraries will exist only for literature.
>
> By 2000 all major industries will be controlled by computers.
>
> By 2000 computers will be as common in private homes as televisions and telephones.

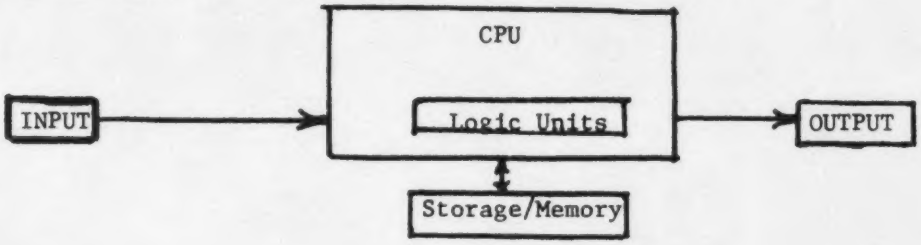
Now, computers are also coming into their own in the field of education. With the advent of the microcomputer, it is now feasible for some districts to purchase one or more within their school budgets. Microcomputers provide a means for creative work in music and art, a classroom management tool, test scoring, general administrative needs, individualized curriculum, and computer operation and programming.

This pamphlet is a guide for the purchase of microcomputer instructional software. Additionally, selection consideration (which should be taken into account at the time of purchase of instructional programs) will be addressed.

A companion publication, "A Guide To Microcomputers" should be reviewed prior to proceeding with that which is contained herein.

BACKGROUND

As detailed in the companion publication "A Guide To Microcomputers", a computer is composed of four basic parts: the input unit, memory unit, central processing unit and output unit. The Central Processing Unit (CPU) is considered the "Brain" that manipulates all information and performs all operations. All other components of the microcomputer have interaction with the CPU.



INPUT is often in the design of a keyboard resembling a typewriter. Input is the way information is put from the outside to the inside of a computer for the purpose of processing. Inputs may also be in the form of cassette, floppy disk, magnetic card, CRT (Cathode Ray Tube), paper tape reader, or solid state chips or other computers through telephone lines and a modem.

OUTPUT is often the same as the input mode whereby processed information and results of calculations go out. Outputs come frequently as CRT terminal, printer, magnetic tape, cassette, plotter, disk or other peripherals. Outputs can be transmitted through a telephone or cable TV line.

MEMORY is where information is stored. It can be found in two forms. It is found in terms of RAM or ROM. RAM is Random Access Memory which allows the CPU to store and gather data rapidly, i.e., 16K (16,000 characters or bytes) of storage. Another memory is ROM - Read Only Memory. ROM is an integrated circuit on which data or instructions are programmed at the time of manufacture inside the CPU. All memory is stated in terms of bytes such as 8K (8,000 characters or bytes) of information.

CPU The CPU conducts all information processing in and out of the other three parts of the computer. The electronic impulses from the other computer segments are sent to their necessary units by the CPU. The arithmetical logic performs all the arithmetical and logical operations. Such operations as addition, subtraction, multiplication, division and comparing are carried out in the logic area. The CPU also takes care of sorting and rearranging information such as alphabetizing. The knowledge contained in the memory of the CPU, and how to manipulate that knowledge, is referred to as software.

MICROCOMPUTER SOFTWARE

Microcomputer software in the most general terms is the internal knowledge within the microcomputer. The machine language which the microcomputer uses in the processing of data, the program that controls what will happen to the data, and the data entered into the microcomputer all combine to be microcomputer software.

A portion of this software will be built into the ROM (Read Only Memory) of the microcomputer. One will have little control over this after a microcomputer has been acquired. Some microcomputers will allow the user to change the language, and the capability of the microcomputer, by changing the chips or memory boards. Normally a person would need considerable microcomputer experience prior to becoming involved at this level of software decision. Decision making of this level is also well beyond the scope of this publication. There are, however, software decisions that need to be made by educators who are not computer experts.

The software selection that will be discussed within this publication will deal with computer-based instruction (CBI). CBI is divided into two general areas, both directly classroom-related; first, instructional software and secondly, classroom management software. This should not be interpreted to indicate that these are the only applications for microcomputers in the schools. On the contrary. There are many other applications, from guidance to finance, word processing to inventory control, which may be viable implementation procedures for microcomputers in our school systems. In the companion publication "A Guide To Microcomputers" forms are provided that will assist in the selection of various uses of the microcomputer in the total school setting.

Unlike most other forms of instructional media, microcomputer software is not compatible from one brand of microcomputer to another. Therefore, if the user already owns a microcomputer, certain constraints relative to software selection must be recognized. If a microcomputer is not owned, hardware selection and software selection may be made as a joint decision. One should not be misled by the fact that a particular software company may be selling the same program for several brands of microcomputers. While the end product will be the same, the specific item purchased will be made to run only on the type of microcomputer for which it is programmed. One must also insure that the microcomputer owned has the memory capacity (by bytes) to accommodate the program being purchased.

A second level of consideration must be the type of input device of the microcomputer. Microcomputer instructional software will normally be on one of three formats; cassette, floppy disk or solid state cartridges. One may well have a brand X microcomputer and buy a program designed to run on a brand X microcomputer; but if it has a cassette input and the program purchased is on floppy disk it cannot be used with the microcomputer until an additional investment of $500 to $700 is made for a disk drive.

Some software programs may require specific peripherals and/or capabilities that may not be included as standard equipment with a microcomputer. When evaluating a program, one must consider:

1. Does the software require a printer?

2. Does the software require a speech synthesizer?

3. Does the software require a special musical ability?

4. Does the software require a graphics tablet?

5. Does the software require joy sticks?

6. Does the software require color capability?

7. Does the software require a change of internal computer language?

The above listed considerations may not be all inclusive but surely will point out the need to know what hardware and accompanying peripherals are necessary to operate necessary software.

The user must look at all the requirements needed to run the software that is being considered for purchase. Microcomputers, unlike other forms of media, have a potential for a multitude of built-in noncompatible elements. These elements, which produce many headaches in the software selection activity, provide the basis for the most flexible and adaptable instructional media system available. They also provide certain instructional advantages when properly implemented; however, we have not yet discussed any of the direct instructional considerations that must be taken into account in the selection of software.

INSTRUCTIONAL CRITERIA IN SELECTION

Hardware compatibility considerations are necessary because the software will not run unless everything matches. The hardware is simply the vehicle to transport the all important item--the instructional program. Instructional design becomes extremely important in this media because the microcomputer becomes the teacher for the period of time the student is interacting with, and learning from, the microcomputer.

The first step in making the software selection is to have a definite educational objective stated in terms of what the software is to accomplish. The user must know and be able to express the instructional needs. Then by systematically evaluating the software available, one can determine that which best matches needs. Many elements will be involved in the final determination which will insure that the software quality is sufficient to accomplish the instructional requirements.

Many areas of consideration both for microcomputer instructional software and for the other forms of instructional media are the same:

1. Does the software have instructional objectives stated?

2. Are the grade levels identified?

3. Are target populations identified?

4. Are prerequisite knowlege levels identified?

If the producer has stated the answers to these considerations, selection tasks will be much easier. If the producer has not, one must carefully preview the material to answer those questions. This does not imply that one should not preview the material if the producer has provided the above data. One must preview to insure the producer's and user's perceptions are identical; however, the preview task will be much simpler.

Another important selection consideration is that of learner verification (validation). When one evaluates an instructional package, one should be told how many times it has been tested and if it was revised based upon those tests. Further, one should have the data as to the background of the student population on which the tests were based. The numbers of students involved are not as important as the fact that testing occurred and revisions were made based upon those tests.

The author(s) should be identified and their backgrounds stated. There are many programs currently on the market that have been written by computer hobbyists and sold through various computer stores and computer magazines. These people generally do not have an educational background and most will have tested the programs relative only to their ability to run accurately in a computer sense; but, they do not have the background to adequately test its educational value.

Programs that are educationally sound should be correlated with existing major texts, and, in some cases, to reference works and other media forms. This correlation becomes very important if you plan to use that microcomputer program as a part of the curriculum in an existing course. It, of course, would be less important if the microcomputer is used to teach an independent curriculum or body of knowledge.

The instructional strategy used by the computer must also be considered. If the program is to be used as a portion of a current curriculum, the strategy implemented by the computer must match that which is currently being employed. However, if the computer will carry the bulk of the instruction, it is necessary to be sure that the strategy employed will maintain the interest of the students while accomplishing the instructional goal. The various broad instructional strategies employed by microcomputer programs are:

1. Drill and practice
2. Tutorial
3. Simulations/gaming
4. Inquiry and dialogue
5. Information retrieval
6. Problem solving

In addition to these broad approaches, some very down-to-earth, nitty gritty points need also to be considered. These include:

1. Are the arithmetic answers written from right to left (as an elementary student would on paper) or left to right. In your instructional situation, would it make a difference which direction they are written?
2. Does the program provide a built-in clock which will provide a time element, which increases the pressure in getting the correct response?
3. Are the instructions for running the program in audio form or in print form? If they are written, can the intended student population read them? Do you want someone to be with the computer to read the instructions to your nonreaders?
4. Is the program of the linear type where all students must answer all the questions or is it of the branching type where the next question asked is determined by the response given on the last question?
5. Does the program provide a prescription for the students based upon the responses currently given by the students? Is the prescription correlated to the text or reference books currently in use in your school?

6. Does the program record the progress of the students in an ongoing file? Is the file organized so that you can use it? Does it differentiate between first try correct responses and subsequent try correct responses?

7. Is color an integral part of the program or is it simply there to add interest? Could a color program be used on a black and white monitor without losing the importance of its instructional aspect?

There may not be a program that does everything a user may want, but by applying as many criteria as possible one can select the best product on the market which best meets the instructional objectives.

An additional source of programming that one may consider are the operational programs. These programs are sold to perform operational tasks, as opposed to programs designed for instruction. Examples might be a word processing program that is used for business applications and could be used to teach word processing. Many business use microcomputers for bookkeeping and inventory data which could be used for practice by high school students in their preparation for the world of work. A statistics program could be used in high school statistics classes. These types of activities will bring the real world into the classroom.

Reviews of microcomputer software are found in many of the computer-oriented periodicals. These reviews may be helpful in acquiring an outside perspective of a program. In using these reviews, one must remember that most of the reviews are done by computer experts not educational or subject matter experts. This may be the best source in determining if the computer programming aspect of the software is of high quality. If the review is to be of value for instructional purposes, it should detail the above criteria. Some periodicals that review software are part of a computer structure that also produces software for sale; this situation produces a potential conflict of interest that one must be aware of.

LOCALLY PRODUCED INSTRUCTIONAL PROGRAMS

The time required for the development, testing, and revisions necessary to produce quality instructional microcomputer programs will discourage most classroom teachers from producing their own instructional microcomputer programs. In addition to the large time investment in the actual production, the producer must have a thorough knowledge of programmed instructional techniques and some computer programming skills.

Several companies have produced "Intelligent Authoring Systems" (IAS) which reduce the requisite computer programming skills. However, if the programs produced utilizing the IAS Programs are to be of a high quality, the author must still have a knowledge of programmed instruction. IAS will reduce to some extent the time involved in program writing but not in the planning or testing. "Genis" for the Apple II Computer and "Pilot Plus" for the TRS-80 Computer are examples of IAS programs that are commercially available.

The one activity which may be feasible for the average teacher to develop is testing. Most IAS programs lend themselves to the testing activity. The time invested by teachers in planning their tests and typing the tests would not be extended appreciably by producing materials for the computer. The computer can reduce the teacher time by grading the test for the teacher. In today's environment, the reduction of staff time, not its increase, must be a very important consideration if microcomputers are to become a viable form of instructional media.

Some teachers will invest the time to develop and validate locally produced instructional software. Many of these teachers are willing to share their effort with fellow teachers. It behooves the school to participate in user groups that are organized to share productions. Appendix 1 is a partial list of these groups. Keep in mind, all material acquired for instructional purposes must be examined according to the same criteria, whether it is acquired from user groups or from commercial producers.

SELECTION POLICY

As with other forms of media, the school district should have a stated policy relative to the selection of microcomputer software (This may be included in a general media selection policy). This policy should be reviewed and passed as school board policy.

Some of the elements that should be included are:

1. How the evaluations are to be made.

2. Who will conduct the evaluations.

3. Evaluation forms to be used.

4. How citizen inquiry or challenges are to be handled.

Microcomputer software programs are less likely to be controversial in context than other forms of media; however, the use of microcomputers in instruction may become an issue. Experience has shown that a well thought out selection policy, including a procedure for citizen inquiry, will eliminate what may otherwise become a public controversy. A suggested evaluation form is included as pages 16 and 17 which may be used in the selection of microcomputer software.

OTHER CLASSROOM APPLICATIONS

Many schools are beginning to include course work relative to computers in their curriculum. This course work is usually referred to as "Computer Literacy." A computer literacy curriculum may be a mini-course offered from six to eight weeks or an entire year's work. Topics covered in this curriculum offering generally include:

1. Computer capabilities and limitations
2. Application of computers in everyday life
3. Impact of computers on society
4. Computer system components
5. Introduction to computer programming

These courses have been introduced early in elementary school and as late as high school gifted classes, or in the grades in between. "PENNET" (Pennsylvania Educational Telecommunications Network) staff of the PDE have developed a computer literacy course of study for use in the junior high school.

The most common data input used in the computer literacy programs is a typewriter-type keyboard. As more and more schools implement this type of program in the lower grades, it may be necessary to teach keyboard skills (typing) at the elementary level.

Currently, many students are more computer literate than their teachers, as a result of microcomputers finding their way into the home faster than they are into the schools. With the advent of more computer literate students, it becomes necessary to develop computer literacy within the professional staff. Inservice programs of similar content to the student computer literacy curriculum should be available to the professional staff. The content should be expanded to include educational applications.

The microcomputer that assists the teacher in his/her teaching may also assist the teacher in classroom management. Classroom management system (CMS) software is being marketed by most of the large commercial microcomputer software producers. Through this type of system the teacher can keep track of attendance, grades, test scores (subject, intelligence, aptitude, etc.), and any other background data desired. The computer can then generate an infinite number of comparisons and reports which will aid the teacher as well as the student. CMS will also reduce the clerical time currently expended by the teacher. The computer can generate data about an individual or an entire class in just a few seconds. This data would take many hours for the teacher to do by hand.

It is important to recognize that the computer can do all of this and more but that it is under the control of, and for the benefit of, the classroom teacher. The computer will organize, analyze and report to the teacher, resulting in the teacher becoming more productive because of accurate, in-depth and timely data relative to the individual student and the class.

HARDWARE/SOFTWARE INTERFACE CRITERIA

The following instructions should be used to complete the hardware/software sheet (an example is on page 11).

A. In the left hand column identify the on-hand hardware that will be available to run the software being evaluated.

1. Specify the brand and model of the microcomputer available.

2. Determine the language capability and memory size. For example, the Apple II Microcomputer may be equipped for the "Apple Soft" or "Integer Basic" as well as other language formats. The TRS-80 may be model I or II and may have language differences of level I or II as well as other language formats. The memory size may vary from 4K or 48K or more. Check specifications on your microcomputer before proceeding.

3. Examine what peripherals you have on hand. When dealing with the cassette and disk drive input devices indicate the quantity available for this application.

4. Check out the video monitor. The specifications will indicate if it is high resolution (minimum 256 lines of resolution). If it not so indicated, assume it to be low resolution. Determine if the unit is color or black and white.

B. In the right hand columns you will provide the appropriate data relative to the program being evaluated. Most, if not all of the data, will be available from the advertising, specification, or operational sheets accompanying the programs. At the top of the column, identify the program title and producer.

1. Identify what microcomputer or computers the program will run on. List the language and memory size specified by the software.

2. List what peripherals are needed by the specific program.

3. Determine if high or low resolution graphics are specified. If it is not specified, assume it to be low resolution graphics. Also identify if the program is color or black and white.

C. After the data is recorded it will be apparent which software matches the hardware available and where discrepancies exist. At this point, a determination must be made as to which material will be further evaluated. If the program format is not compatible with the hardware, the hardware will have to be upgraded or the material need not, and cannot, be previewed. Programs found to be compatible with the hardware available should be further evaluated for their instructional applicability by using the "Microcomputer Instructional Software Evaluation Form. (pages 16 and 17).

If hardware is to be purchased as the result of a need for specific software, hardware specifications can be developed by first completing the right hand columns of the Analysis sheet.

HARDWARE/SOFTWARE INTERFACE ANALYSIS SHEET

HARDWARE On Hand		SOFTWARE Program Title _____ Program Producer _____
	MICROCOMPUTER	
_____	Brand	_____
_____	Model	_____
_____	Language	_____
_____ Bytes	Memory Size	_____ Bytes
	PERIPHERAL	
_____	Cassette Input	_____
_____	Number	_____
_____	Disk Drive Input	_____
_____	Number	_____
_____	Solid State Input	_____
_____	Printer	_____
_____	Joy Sticks	_____
_____	Graphic Tablet	_____
_____	Speech Synthesizer	_____
_____	Music Board	_____
_____	Special Sound Amplifier	_____
_____	Other (Specify)	_____
_____		_____
	MONITOR	
_____	High Resolution	_____
_____	Low Resolution	_____
_____	Black and White	_____
_____	Color	_____

MICROCOMPUTER INSTRUCTIONAL SOFTWARE EVALUATION CRITERIA

The "Microcomputer Instructional Software Evaluation Form" is designed to assist the educator in developing the unique specifications necessary to acquire commercially produced microcomputer instructional software to meet the school's special instructional needs. Probably no program will match exactly, but if the instructional needs are thoroughly considered, an intelligent decision can be rendered as to which software program will best meet those needs.

In completing the evaluation form, the user should first express the instructional objective at the top. Then indicate in the left hand column which items are needed to accomplish that objective (A through F). Then, from a combination of extracting data from the program's description and from actual preview, complete the right hand column.

The criteria for completing the left and right hand columns of the evaluation form are as follows:

A. Objective. Has the stated or observed instructional objective of the program accomplished the indicated instructional objective developed by the school. Is the content accurate, complete and organized in a logical sequence?

B. Grade Level. State the grade level of the intended student audience and of the material being evaluated. If the producer provides the grade level indication, the evaluator should verify its accuracy through actual observation.

C. Validation. Validation data should be acquired from the producer or vendor's descriptive data.

D. Correlation. The basic data provided by the producer should indicate correlation with existing textbooks, reference books, or other media forms. If correlation data is desired but not provided by the producer the user may consider developing this correlation locally.

E. Instructional Strategies. The instructional strategy employed by the computer program must complement the normal classroom procedures.

1. Drill and practice. The computer asks questions and seeks responses objectively using a very repetitive type of programming procedure. Drill and practice offers individualization for the student to work at his or her own pace, usually providing immediate feedback for correct or incorrect responses. Examples of typical drill and practice would be shape recognition, math facts, spelling, word recognition and memorization of factual information. The learner or the teacher can determine the level of difficulty, the amount of work and the content to be covered in each session.

2. Simulation/gaming. Simulation is one of the more interesting modes in the use of computers. The instruction is accomplished as a result of a simplified situation that is analogous to a real life situation. The student is assigned a problem based upon knowledge known. The learner must then make a decision as to what to do. Immediate reaction or consequence is provided as a direct result of the action taken by the learner.

   Discovery learning takes place by the trial and error method. Simulation is as close to real life situations as possible and is currently found being used in such curricular areas as economics, genetics, biology, history, driver education and flight training.

   Gaming is probably the most familiar application. Learner-oriented games develop logical thinking, sequencing skills, manual dexterity, factual knowledge and problem solving. The student will build skills in acquiring knowledge, how to analyze a task and the transfer of problem solving strategies to other problem solving situations.

3. Inquiry and dialogue. An interactive program in which a user indicates a specific area of knowledge. The micro-computer then provides a routine which will upgrade the user's knowledge in that specific area. The programming would be in small, specific segments of instruction as compared to a full course of study.

4. Problem solving. A technique most commonly applied to the physical sciences and mathematics. This technique is also appropriate for teaching consumerism, resource conservation, interpersonal relationships and other subjects where problems can be defined.

5. Information retrieval. A data bank of information which serves as a resource for the users. This reference source would be faster than using reference books. An example should be a thesaurus of synonyms and antonyms, scientific data, subject-oriented central information file, etc.

6. Tutorial. Tutorial computer teaching is closely related to the traditional lecture method. Information is presented in an organized fashion, including frequent one-to-one reinforcement, as the learner responds. A summary of key concepts and information learned as well as how it relates to the real world may be found at the end of each unit.

F. Instructional Design Features. When specifying instructional design features, it must be remembered that the more complex the requirement the more peripheral hardware will be required.

1. If the student instructions are in printed form, either on paper or on the video screen, they must be of the appropriate reading level for the student user. If the intended user is a nonreader, the instructions must be given in an audio form through the computer speaker system or cassette player speaker. Perhaps an aide would need to be with the computer to read the instructions to the nonreading student.

2. The user may desire the program to have a time element involved as well as simply indicating a right or wrong response. Programs with a timed feature built in may be designed where that feature can be selected for use with certain students or not used with other students. When students are competing with the clock, a normally simple problem becomes much more challenging.

3. When the program is presented in a linear format, all students must proceed through each step of the entire program. If the program is of the branching type, the computer will evaluate a given response and then choose the next activity based upon that response. A branching program may have remedial branches as well as advanced branches to accommodate a wide range of abilities.

4. Some programs will provide student progress on a daily basis only. This requires the teacher to maintain permanent records. More sophisticated programs will maintain accumulated data throughout the student's progress in the program. A potential user should examine the progress data to determine if it will be useful, as provided by the computer program, to the local instructional environment.

5. Based upon the instructional stategy, it may be desirable that the student's performance be analyzed and study assignments or homework be prescribed by the computer.

On side two of the form, complete the following:

A. Description of the program. Describe in narrative form the strengthes, weaknesses and other observations of the program.

B. Recommended for. In narrative form, identify the grade level and student ability level (advanced, remedial, etc.) as well as the course(s) for which the program is best suited.

C. Overall evaluation. This judgment should reflect the evaluator's opinion of how well the program functions as a whole. It is possible that individual parts of a program may do quite well individually but will not function well as a whole or a program may have some weaknesses but the program overall functions well.

The reviewer should evaluate the documentation and instructions carefully. Special attention should be given to the ease of use; both from the viewpoint of the nontechnically-oriented teacher and the student.

D. Evaluator. The name of the evaluator should be printed along with the evaluator's position (ninth grade science teacher, second grade teacher, principal, librarian, etc.).

MICROCOMPUTER INSTRUCTIONAL SOFTWARE EVALUATION FORM

Instructional Objective Desired: _____

Desired Instructional Needs	Program Title _____ Producer _____ Cost _____
A. Objective (Above) B. Grade Level _____ C. Validation D. Current Text in Use: _____ _____ E. Instructional Strategies Needed: _____ Drill and Practice _____ Simulation/Gaming _____ Inquiry and Dialogue _____ Problem Solving _____ Information Retrieval _____ Tutorial F. Instructional Design Features: 1. Student Instructions _____Audio _____Written 2. Built-in Clock ____Yes ____No 3. _____Linear _____Branching 4. Student Progress _____Daily _____Cumulative 5. Prescription or Homework Assigned _____Yes _____No	A. Objectives Met: _____Yes _____No Content: ____Good ____Fair ____Poor B. Grade Level _____ C. Number of Times Tested _____ Number of Times Revised _____ Students Tested: Number _____ Grade Level _____ D. Correlated With: _____ _____ E. Instructional Strategies Employed: _____ Drill and Practice _____ Simulation/Gaming _____ Inquiry and Dialogue _____ Problem Solving _____ Information Retrieval _____ Tutorial F. Instructional Design Features: 1. Student Instructions _____Audio _____Written 2. Built-in Clock ____Yes ____No 3. _____Linear _____Branching 4. Student Progress _____Daily _____Cumulative 5. Will the program prescribe study assignment or develop homework? _____Yes _____No

MICROCOMPUTER INSTRUCTIONAL SOFTWARE EVALUATION FORM (Continued)

Description of the Program:

Recommended for _____
(Include grade level, course and student ability level)

Overall Evaluation:

____Excellent ____Good ____Fair ____Poor ____Unacceptable

Evaluator's Name _____

Position _____

Appendix 1

User's Groups and Local Computer Clubs

1. Apple for the Teacher (National Apple Computer)

   Ted Perry
   5848 Riddio Street
   Citrus Heights, CA 95610

2. Apple Cart (National newsletter and software exchange for Apple Computer)

   SASE
   C. Brandon Gresham, Jr.
   The Apple Cart
   23 Van Buren Street
   Dayton, OH 45402

3. Keystone Apple Core (Central Pennsylvania Apple Computer)

   Tim Suskay
   4644 Carlisle Pike
   Mechanicsburg, PA 17055

4. TRS-80 User's Group (Central Pennsylvania Radio Shack Computer)

   Tim Suskay
   4644 Carlisle Pike
   Mechanicsburg, PA 17055

5. Pittsburgh Area Computer Club (most brands)

   Circulation Department
   400 Smithfield Street
   Pittsburgh, PA 15222

6. Pennsylvania Area Computer Society (Apple, Pet, Radio Shack Computers)

   Meets the 3rd Saturday of each month at LaSalle College,
   Philadelphia, PA 19141

7. Philadelphia School District (Apple User's Group)

   Ms. Sylvia Charp
   Philadelphia School District
   Parkway at 21st Street
   Philadelphia, PA 19103

Appendix 2

Data Based System (software libraries)

1. The Source

   Tele-Computer Corporation
   1616 Anderson Road
   McLean, VA 22012

2. Maine Software Library

   P.O. Box 197
   Standish, ME 04084

3. Computer Using Educators

   W. Don McKell
   Independence High School
   1776 Education Park Drive
   San Jose, CA 95133

4. MECC Instructional Services Division (Apple II Library)

   2520 Broadway Drive
   Lauderdale, MN 55113

5. Basic Programs for Educators (Apple, Pet TRC)

   CONDUIT
   University of Iowa
   Iowa City, IA 52242

6. The ATLA Experience

   Micropower and Light Company
   1108 Keystone Department C
   13773 North Central Expressway
   Dallas, TX 75243

7. COMPUSERVE (Data Bank)

   Compuserve
   5000 Arlington Center Boulevard
   Columbus, OH 43220

8. Mead Data Central (Interactive news retrieval system)

   $50.00 month; $1-1.50 hr. charge

Appendix 3

Bibliographies and Reference Material

1. Microcomputers in Education

   AECT
   1126 16th St., NW
   Washington, D.C. 20036

2. A Reference Shelf for Educators Considering the Use of Computers in the Instructional Process

   CRLT
   University of Michigan
   109 East Madison Street
   Ann Arbor, MI 48104

3. Computing Newsletter -- Annual Bibliography

   Computing Newsletter
   University of Colorado
   Colorado Springs, CO 80907

4. Search of Educational Software for the Apple

   Mr. John Wernegreen
   Eastern Kentucky University
   Department of Natural Sciences
   220 Memorial Science
   Richmond, KY 40475

5. School Micro Ware (A directory of instructional microcomputer software for Radio Shack, Pet, Apple II)

   Dresden Associates
   P.O. Box 246
   Dresden, ME 04342

6. Periodical Guide for Computerists (An annual index of personal computing magazine articles)

   Berg Publications
   14751 112th Avenue, NE
   Kirland, WA 98033

Appendix 4

Organizations

1. National Council of Teachers of Mathematics

   NCTM
   1906 Association Drive
   Reston, VA 22091

2. National Science Teachers Association

   NSTA
   1742 Connecticut, NW
   Washington, D.C. 20009

3. Association for Educational Data Systems

   AEDS
   1201 16th Street, NW
   Washington, D.C. 20036

4. Association for the Development of Computer-Based Instructional Systems

   ADCIS
   Computer Center
   West Washington State College
   Bellingham, WA 98225

GLOSSARY

This glossary of terms deals specifically with microcomputer software. For a more complete glossary dealing with microcomputers, the reader should consult the companion booklet "A Guide to Microcomputers."

BASIC

An acronym for beginners all purpose symbolic instruction code. A high level conversational, interpretative programming language in wide use. Always written in capital letters, BASIC was invented by Kemmeny and Curtz at Darmouth College in 1963. It permits the use of simple English words and common mathematical symbols to perform the necessary arithematic and logical operations needed in programming microcomputers.

BRANCHING PROGRAMS

An instructional program designed in such a way that the student's progress through the program is determined by the specific answers given. If remedial work is required, the microcomputer will take the students into a remedial branch and provide the work necessary before continuing through the main portion of the program. The path a student uses is determined by that student's response.

CAI

See Computer Assisted Instruction.

CASSETTE (CASSETTE RECORDER)

A device for preserving internally stored information. Because most computers lose the information stored in them when they are turned off, a means of permanent storage of the information is necessary. This method of storage is faster than disks or solid state cassettes. Cassettes are the same as audio recording cassettes.

CBI

See Computer Based Instruction.

CLASSROOM MANAGEMENT SYSTEMS

A program that maintains the class records for a teacher. It may include grades, test scores, attendance, as well as other student information.

CMI

See Computer Managed Instruction

COMPATIBILITY

There are two types of compatibility: program and hardware. The program compatibility refers to the ability to run programs on a variety of computers without changing the program language. Hardware compatibility means the various components (printers, disks, keyboards, etc.) may be connected directly without intervening electronic devices and that all components use the same baud rate, word length, and other technical aspects in order to communicate. Compatibility also should be considered between the computer program and the normal instructional program used in the school.

COMPUTER ASSISTED INSTRUCTION

Direct instruction conducted by the computer. Examples of this type of instruction are: drill and practice, tutorial, simulation and gaming, inquiry and dialogue, information retrieval, and problem solving.

COMPUTER BASED INSTRUCTION

The overall term used to describe the use of computers in the instructional process. Usually divided into two areas: computer assisted instruction and computer managed instruction.

COMPUTER LANGUAGE

A language used to communicate with a computer. All computer language instructions must be translated by a program within the computer into the machine's internal language in order for the instructions to be implemented.

COMPUTER LITERACY

An understanding of computers and their application in the everyday world. To be computer literate, a person should have a cursory understanding of: computer programming, problem solving, applications of computers in various fields, the impact of computers on society, computer system components and computer capabilities and limitations.

COMPUTER MANAGED INSTRUCTION

Instructional support functions conducted by the computer. Examples of the support functions are: testing, prescribing, record keeping, schedule monitoring, and time and resource management.

CORRELATION

The matching of the content of instructional software with textbooks, reference materials and/or instructional media.

COURSEWARE

Computer programs (software) designed for instructional purposes. See also software.

CRT

An acronym for Cathode Ray Rube. Similar in appearance to a television screen. Most microcomputers use a CRT as their output device. See also monitor and video display unit.

DISK (DISC)

A record-like magnetic-coded piece of material that can store programs, data or tables of information. The process is similar to storing music information on a magnetic tape. Commonly found as floppy and hard disk systems.

DISK DRIVE

A mechanical unit that may be built into the microcomputer case or may be an add-on peripheral which reads and records on a round magnetic surface. See also "Disk" and "floppy disk."

GRAPHICS

Characters that can be used to form figures, shapes, and forms on the CRT or printer. In addition to letters and numbers, a computer may have a graphics character set that can be used to create graphics by writing them into a traditional computer program, by using a graphics tablet, or by using a light pen on the CRT surface; depending upon the capability of the particular microcomputer.

GRAPHICS TABLET

A flat device, when drawn upon, which will transmit the drawing to the output device, microcomputer's memory and/or its storage device.

HARDWARE

Mechanical, magnetic, electrical and electronic devices which make up a computer. The physical equipment that goes into a computer system consisting of the central processing unit plus all the peripherals.

HIGH RESOLUTION

A video monitor or the microcomputer's capability of producing and reading at least 256 lines or columns of dot pattern. High resolution graphics produce an image that has the detail approximating a photograph.

IAS

See Intelligent Authoring Systems.

INTELLIGENT AUTHORING SYSTEMS

A prepared program that guides an author through the process of developing an instructional program. It usually requires little or no computer skill to produce a program with one of these systems.

JOY STICKS

Small control devices which allows the computer operator to control actions or graphics on the CRT. Most commonly associated with their use in computer games.

LANGUAGE

A format by which a programmer can communicate effectively with a computer where predetermined commands will produce requested actions. BASIC is one of the most popular langauges used with microcomputers.

LEARNER VERIFICATION

See Validation.

LINEAR PROGRAM

A program written in such a way that all students must proceed through each step or question of the program.

LOW RESOLUTION

Video monitors or microcomputer capabilities that produce graphics as a series of square blocks. Usually, there are 64 blocks in each row.

MEMORY

The integrated circuits of a computer which store information. In microcomputers, they are referred to as RAM and ROM.

MONITOR

A video display unit which uses a CRT tube to generate characters. It looks much like a normal television set and may be either black and white or color, as well as high or low resolution.

PERIPHERAL DEVICE

A device, such as a printer, mass storage unit, or keyboard, which is an accessory to a microprocessor and which transfers information to and from the microprocessor.

PROGRAM

A series of instructions to a computer which cause the computer to solve a problem or perform a task.

PROGRAMMED INSTRUCTION

A technique of organizing instruction into a series of very small segments which by their design leads the learner through the program with a minimum of incorrect responses.

RAM

An acronym for random access memory. Any memory which can be written on or read from by a program and in which the memory locations can be accessed in a random sequence. RAM can be erased and reprogrammed by the programmer as frequently as necessary. RAM size is expressed as a quantity of bytes, such a 4k (4,000 bytes). RAM may be expanded by adding memory chips or memory boards.

RANDOM ACCESS MEMORY

See RAM.

READ ONLY MEMORY

See ROM.

ROM

An acronym for read only memory. It is made of an integrated circuit on which data or instructions are programmed at the time of manufacture. It cannot be erased or reprogrammed by normal computer operations. The size of ROM is expressed as the quantity of bytes, for example, 12k (12,000 bytes).

SOFTWARE

The programs and accompanying documentation. Software is stored on tape cassettes, disks, and solid state cartridges. These are permanent method of storage and are not erased when the computer is turned off. The computer reads the software into its temporary memory (RAM) in order to manipulate the data in its functioning. See also courseware.

SOLID STATE CARTRIDGES

Storage devices that are composed of micro processor chips which allow for playback but not recording. This produces the fastest type of loading. This method of recording is very hard to copy.

SPEECH SYNTHESIZER

A device which allows the computer to produce words and phrases as audible sounds.

VALIDATION

The testing of an instructional program on a representative sample of the intended users, then revising the program and/or content, when retesting. This procedure should be repeated until the program is guaranteed to produce the results attributed to it without failure.

VIDEO DISPLAY UNIT

A component of a microcomputer system which displays the output on a screen similar to a TV screen. See also Monitor and CRT.